1

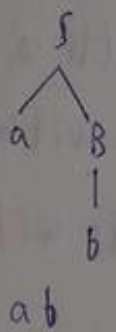
① 12

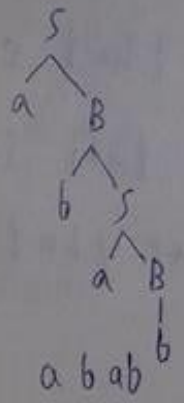
y, ya, yaa, yab, xy, yy, xxy, xyy, yxy, yyy, xya, yya

② ab (a+b)* bba

other experessions don't accept ab aba bba

③ equal number of a's and b's



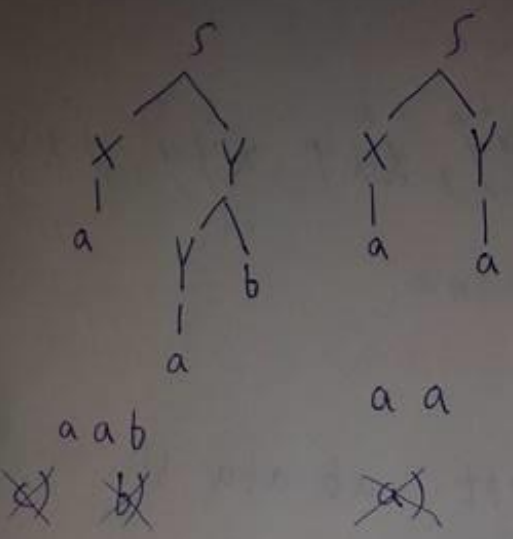


both a's and b's can be even or odd (other choices are wrong)

④ (a+b)(a+b)*

both CFG and the regular expression accept any string that starts with a or b and followed by any sequence of a and b

⑤ d) has at least two a's



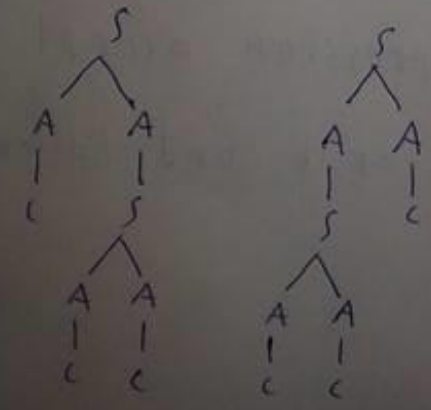
a a b ~~a~~ ~~b~~ ~~a~~

other choices are wrong
the CFG accept aab, aa

⑥ d) $b(a+b)^*a$

L_1 accepts all strings that end with a
and L_2 accepts all strings that starts with b
the intersection is all strings that starts with b and end with a ($b(a+b)^*a$)

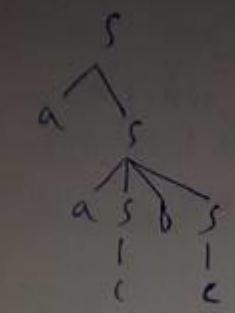
⑦ a)

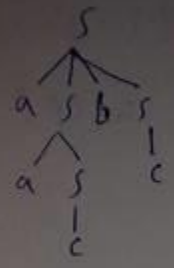


ccc ccc

ambiguous
2 parse trees For ccc

⑦ b)



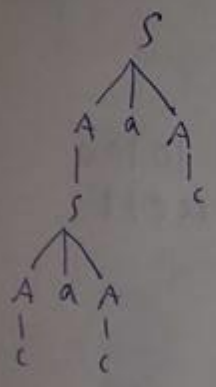


ambiguous

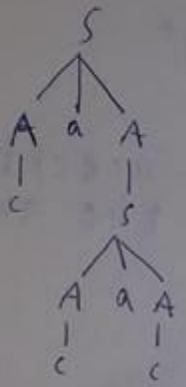
aacbc

aacbc

⑦ c)



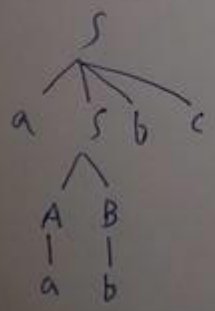
cacac



ambiguous

cacac

⑦ d)



No distinct parse trees For the same string (unambiguous)

⑦ a), b), c) ambiguous

⑧ c) $(011)^* 011$

other expressions don't accept 011 which the automata accepts

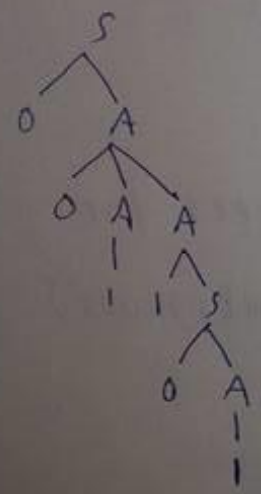
⑨ b) can't

because it can't know How many time each state is visited

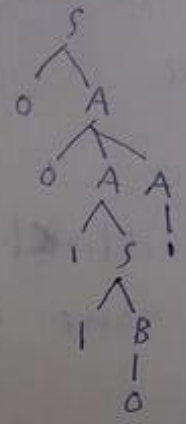
⑩ a) $(0 + 1(1 + 01)^* 00)^*$

other expressions don't accept 100 and 10100 which the automata accept

2 ①



00110|



00110|

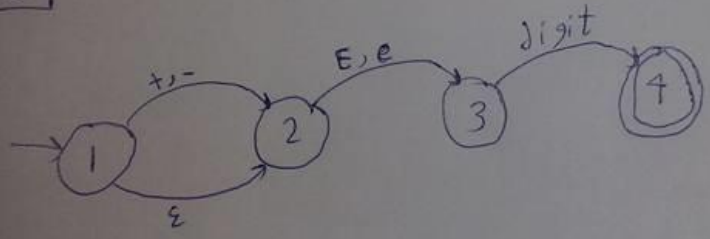
2 parse trees For 00110|

2. ② a) No because it is left recursive

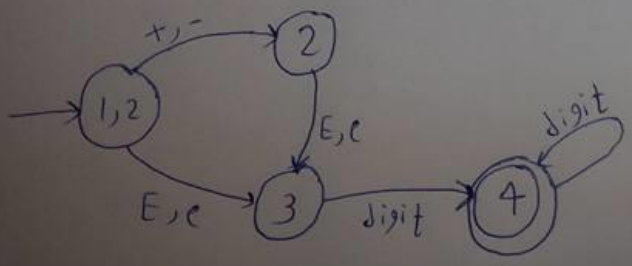
b) $S \longrightarrow \delta A$

$A \longrightarrow \beta \propto A \mid \varepsilon$

3.



+,- input for → 1

E,e → 2

digit → 3,4